PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-089446
(43)Date of publication of application : 07.04.1998

(51)Int.Cl. F16H 57/02

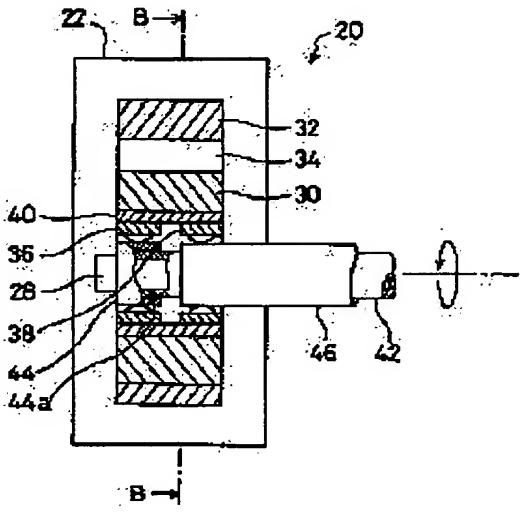
(21)Application number : 09-087728
(22)Date of filing : 21.03.1997

(71)Applicant : TOYOTA MOTOR CORP
(72)Inventor : ADACHI MASATOSHI
IBARAKI TAKATSUGU
HATA YUSHI
SUZUKI HARUHISA
KONDO KOICHI
OSHIMA KEIJIRO

(30)Priority
Priority number : 08215284 Priority date : 26.07.1996 Priority country : JP

(54) HYDRAULIC GENERATOR AND POWER OUTPUT DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To generate hydraulic pressure upon selecting a single one of more than two rotational powers as an input power.
SOLUTION: A hydraulic generator 20 is equipped with a drive gear 30, a driven gear 32 and a crescent 34 constituting a gear pump, and two oneway clutches 36 and 38 attached so as to be engaged at a time when two turning shafts 42 and 46 are rotated each to the drive gear 30 relatively in the same direction, respectively. Accordingly, when these two turning shafts 42 and 46 are rotated in a direction where both are engaged together with each other, the oneway clutch attached to the turning shaft being large in rotational frequency is engaged, driving the drive gear 30. In consequence, the hydraulic generator 20 is able to generate hydraulic pressure by the turning shaft being large in the rotational frequency of these two turning shafts 42 and 46.



LEGAL STATUS

[Date of request for examination] 07.01.1999

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]	3097594
[Date of registration]	11.08.2000
[Number of appeal against examiner's decision of rejection]	
[Date of requesting appeal against examiner's decision of rejection]	
[Date of extinction of right]	

* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] An oil pressure generator equipped with a selection means to choose one of the two or more axes of rotation which can input rotational-motion force which is the oil pressure generator which generates oil pressure according to the rotational-motion force in which it is inputted into an input shaft, and is different, and the axes of rotation of these two not lesses as the aforementioned input shaft.
[Claim 2] The aforementioned selection means is an oil pressure generator according to claim 1 whose rotational frequency of the predetermined direction is a means to choose the largest axis of rotation, between the two or more [above] axes of rotation.
[Claim 3] The aforementioned selection means is an oil pressure generator according to claim 2 which is a means to come to attach in each of the two or more [above] axes of rotation the one-way clutch which does not transmit the rotational-motion force when it is rotation of a direction opposite to this predetermined direction, although the rotational-motion force is transmitted at the time of rotation of the aforementioned predetermined direction to the aforementioned input shaft.
[Claim 4] The prime mover which is the power output unit which outputs power to a driving shaft, and has an output shaft, The 1st motor which has the 1st axis of rotation, and outputs and inputs power to this 1st axis of rotation, The 2nd motor which has the 2nd axis of rotation combined with the aforementioned driving shaft, and outputs and inputs power to this 2nd axis of rotation, When the power which has three shafts respectively combined with the output shaft of the aforementioned prime mover, the 1st axis of rotation of the 1st motor of the above, and the 2nd axis of rotation of the 2nd motor of the above, and is outputted and inputted among these three shafts to any 2 shafts is determined, A 3 shaft type power I/O means by which the power outputted and inputted to one residual shaft based on the determined this power is determined, It is the power output unit which is the axis of rotation which is equipped with the oil pressure generator of a publication 3 either, and is combined with a claim 1, or the axis of rotation by which the two axes of rotation are combined with the output shaft of the aforementioned prime mover and the 2nd axis of rotation of the 2nd motor of the above between the two or more axes of rotation of the aforementioned oil pressure generator.
[Claim 5] The aforementioned oil pressure generator is a power output unit according to claim 4 which it comes to support as the 2nd motor of the above, and one.
[Claim 6] The power output unit according to claim 4 or 5 which comes to prepare the gap which can absorb backlash between the axes of rotation and these output shafts which are combined with the aforementioned output shaft of the aforementioned oil pressure generator.
[Claim 7] There is no claim 4 which comes to prepare the gap which can absorb backlash between the axis of rotation and this 2nd axis of rotation which are combined with the 2nd axis of rotation of the above of the aforementioned oil pressure generator, and it is the power output unit of a publication 6 either.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the power output unit which is equipped with the oil pressure generator and this which generate oil pressure according to the rotational-motion force in which it is inputted into an input shaft in detail about an oil pressure generator and a power output unit, and outputs power to a driving shaft.
[0002]
[Description of the Prior Art] As the former and this kind of an oil pressure generator, it is the oil pressure generator carried in vehicles. For conveyance of oil to a torque converter, the lubrication of the planetary gear unit in transmission, the operation hydraulic pressure supply of the oil pressure control of transmission, etc. It is attached directly [the crankshaft of prime movers (for example, internal combustion engines, such as a gasoline engine and a diesel power plant etc.)] as one component part of transmission, or indirectly. What drives as power a part of rotational-motion force outputted to a crankshaft from a prime mover is proposed. This equipment consists of crescent sash locks 234 pinched like the gear pump 200 illustrated to drawing 11 with casing 220, the drive gear 230 combined with the crankshaft, the driven gear 232 which gears with the drive gear 230 and rotates, and the drive gear 230 and a driven gear 232, and when the drive gear 230 and a driven gear 232 rotate with rotation of a drive shaft, it generates oil pressure. In addition, the inflow path 224 and the outflow path 226 of oil are formed in casing 220.
[0003]
[Problem(s) to be Solved by the Invention] In recent years, from a viewpoint of efficiency use of environmental preservation or an energy resource, a prime mover, a generator, a motor, and a battery are carried and the so-called hybrid type electric vehicle which enables the run by the power outputted, respectively from the run by the power outputted from a prime mover, the run by the power outputted from a motor, and a prime mover and a motor is proposed. When it has gear equipments, such as a change gear, since it is operation of this clutch when connection with the driving shaft combined with the crankshaft and driving wheel of a prime mover is based on gear equipment and connection between the crankshaft of a prime mover and a driving shaft is based on a clutch for the lubrication of this gear equipment and, an oil pressure generator is needed with a such hybrid type electric vehicle for the lubrication of this gear equipment.
[0004] However, although oil pressure can be generated when the above-mentioned gear pump 200 is attached in the crankshaft of a prime mover as an oil pressure generator carried in a such hybrid type electric vehicle, and the prime mover is operated When running with the power outputted from a motor and having stopped operation of a prime mover, since the oil pressure generator did not operate, it could not generate oil pressure, and had the problem that neither operation of a clutch nor the lubrication of gear equipment could be performed. Although there is also the technique of attaching [technique] a gear pump 200 in a driving shaft, and on the other hand generating oil pressure according to the rotational-motion force of a driving shaft, when vehicles have stopped, the problem that oil pressure cannot be generated is produced.
[0005] Although attaching a gear pump 200 in the crankshaft and driving shaft of a prime mover,

respectively is also considered to such a problem, the problem that the number of parts increases and equipment is enlarged since two gear pumps 200 are needed, and the problem that a hydraulic circuit becomes complicated arise.
[0006] These problems are being able to say also about all the driving gears that operate with the power which is not limited to the vehicles carrying a prime mover and a motor, and is outputted from two or more sources of power.
[0007] In addition, an applicant is a hybrid type electric vehicle before equipped with gear equipment, and has proposed the composition (JP,50-30223,A) which attached the hydraulic pump in the crankshaft of a prime mover, and the composition (JP,48-49115,A) which attached the hydraulic pump in the crankshaft of a prime mover, and each of a driving shaft.
[0008] The oil pressure generator and power output unit of this invention solve such a problem, and aim at choosing one of two or more rotational-motion force as input power, and generating oil pressure. Moreover, the power output unit of this invention makes small the input of disturbance, such as vibration of the prime mover to an oil pressure generator, and it sets to consider as equipment with a more high precision to one of the purposes while raising the endurance of equipment.
[0009]
[A The means for solving a technical problem, and its operation and effect] The oil pressure generator of this invention is an oil pressure generator which generates oil pressure according to the rotational-motion force in which it is inputted into an input shaft, and makes it a summary to have a selection means to choose one of the two or more axes of rotation which can input different rotational-motion force, and the axes of rotation of these two not lesses as the aforementioned input shaft.
[0010] The oil pressure generator of this this invention generates oil pressure according to the rotational-motion force in which it is inputted into an input shaft, by choosing one as an input shaft by the selection means between the two or more axes of rotation which can input different rotational-motion force.
[0011] According to the oil pressure generator of such this invention, since one of the two or more axes of rotation is chosen and it considers as the input shaft of power, oil pressure can be generated with the power outputted from one source of power chosen among the power outputted from two or more sources of power.
[0012] In the oil pressure generator of this this invention, the aforementioned selection means shall be a means by which the rotational frequency of the predetermined direction chooses the largest axis of rotation between the two or more [above] axes of rotation. If it carries out like this, oil pressure can be generated with the power inputted into the biggest axis of rotation of the rotational frequency of the predetermined direction.
[0013] In the oil pressure generator which chooses the biggest axis of rotation of the rotational frequency of such a predetermined direction, the aforementioned selection means shall be a means to come to attach in each of the two or more [above] axes of rotation the one-way clutch which does not transmit the rotational-motion force when it is rotation of a direction opposite to this predetermined direction, although the rotational-motion force is transmitted at the time of rotation of the aforementioned predetermined direction to the aforementioned input shaft. If it carries out like this, simple composition can constitute the oil pressure generator which chooses the biggest axis of rotation of the rotational frequency of the predetermined direction.
[0014] The prime mover which the power output unit of this invention is a power output unit which outputs power to a driving shaft, and has an output shaft, The 1st motor which has the 1st axis of rotation, and outputs and inputs power to this 1st axis of rotation, The 2nd motor which has the 2nd axis of rotation combined with the aforementioned driving shaft, and outputs and inputs power to this 2nd axis of rotation, When the power which has three shafts respectively combined with the output shaft of the aforementioned prime mover, the 1st axis of rotation of the 1st motor of the above, and the 2nd axis of rotation of the 2nd motor of the above, and is outputted and inputted among these three shafts to any 2 shafts is determined, A 3 shaft type power I/O means by which the power outputted and inputted to one residual shaft based on the

determined this power is determined, Having the oil pressure generator of this invention including the above-mentioned modification, the two axes of rotation make it a summary to be the axis of rotation combined with the output shaft of the aforementioned prime mover, and the axis of rotation combined with the 2nd axis of rotation of the 2nd motor of the above between the two or more axes of rotation of the aforementioned oil pressure generator.
[0015] A 3 shaft type power I/O means by which 3 shaft type power I/O means has three shafts respectively combined with the output shaft of a prime mover, the 1st axis of rotation of the 1st motor, and the 2nd axis of rotation of the 2nd motor the power output unit of this this invention When power is outputted and inputted to any 2 shafts of these three shafts, the power determined based on this power outputted and inputted is outputted and inputted from one residual shaft. An oil pressure generator sets the two or more axes of rotation selectable as an input shaft as the axis of rotation combined with the output shaft of a prime mover, and the axis of rotation combined with the 2nd axis of rotation of the 2nd motor, and generates oil pressure with the power outputted from a prime mover, or the power outputted from the 2nd motor.
[0016] According to the power output unit of such this invention, oil pressure can be generated with the power outputted from a prime mover, or the power outputted from the 2nd motor by choosing the axis of rotation combined with the output shaft of a prime mover, and the axis of rotation combined with the 2nd axis of rotation of the 2nd motor.
[0017] In the power output unit of such this invention, it shall come to support the aforementioned oil pressure generator as the 2nd motor of the above, and one. If it carries out like this, since mass becomes the 2nd large, big motor of the damping effect, and the thing of one to an oil pressure generator, disturbance, such as vibration of the prime mover inputted into an oil pressure generator, can be made small. Consequently, while being able to raise the endurance of an oil pressure generator, as a result the endurance of a power output unit, precision of an oil pressure generator, as a result a power output unit can be made high.
[0018] It shall come to prepare the gap which can absorb backlash between the axes of rotation and these output shafts by which such an oil pressure generator is combined with the aforementioned output shaft of the aforementioned oil pressure generator in the power output unit which it comes to support as the 2nd motor and one, or shall come to prepare the gap which can absorb backlash between the axis of rotation and this 2nd axis of rotation which are combined with the 2nd axis of rotation of the above of the aforementioned oil pressure generator. If it carries out like this, even if disturbance, such as vibration which is not expected to the output shaft or the 2nd axis of rotation of a prime mover, arises, the input to the oil pressure generator of disturbance can be made small.
[0019]
[Embodiments of the Invention] Next, the gestalt of operation of this invention is explained based on an example. The cross section in which drawing 1 shows the outline composition of the oil pressure generator 20 as one example of this invention, and drawing 2 are the cross sections showing the B-B cross section of the oil pressure generator 20 of drawing 1 . In addition, drawing 1 serves as a cross section showing the A-A cross section in drawing 2 .
[0020] The casing 22 which is the composition same as the oil pressure generator 20 is shown in drawing 1 and drawing 2 as the gear pump 200 of the conventional example explained using drawing 11 , i.e., the composition as a gear pump The drive gear 30 and the driven gear 32 which gears with the drive gear 30 and rotates, The one-way clutch 36 to which it has the crescent sash lock 34 pinched with the drive gear 30 and a driven gear 32, and also engages with the 1st axis of rotation 42 of a hollow shaft only at the time of rotation of the predetermined direction, Similarly it has the one-way clutch 38 which engages with the 2nd axis of rotation 46 of the hollow shaft which penetrated the shaft center free [rotation] to the 1st axis of rotation 42, and the holddown member 40 which fixes one-way clutches 36 and 38 to the drive gear 30 only at the time of rotation of the predetermined direction.
 [0021] As shown in drawing 2 , the crevice by the side of the lower left of a crescent sash lock 34 and the outflow path 26 of oil open for free passage as well as the crevice by the side of the lower right of a crescent sash lock 34 and the inflow path 24 of oil open for free passage are formed in casing 22 among the crevices between the drive gear 30 and a driven gear 32. This outflow path 26 is connected with

the tap hole 28 formed in the casing 22 shown in drawing 1 , and oil is fed from this tap hole 28 in the inside of the 1st axis of rotation 42.
[0022] the engagement in a circle by which attachment fixation was carried out at the periphery of the 1st axis of rotation 42 when the 1st axis of rotation 42 tended to rotate an one-way clutch 36 in the direction of the arrow in drawing 1 relatively to the drive gear 30 -- it is attached so that it may engage with a member 44 an example -- this engagement -- the member 44 is being fixed to the 1st axis of rotation 42 by lock-pin 44a where some path clearance is prepared between the 1st axis of rotation 42 Therefore, even if the 1st axis of rotation 42 carries out eccentricity by external force, the so-called backlash is absorbed by this path clearance. Moreover, when the 2nd axis of rotation 46 tends to rotate in the direction of the arrow in drawing 1 relatively to the drive gear 30, the one-way clutch 38 is attached so that it may engage with the 2nd axis of rotation 46. Thus, while the 1st axis of rotation 42 and 2nd axis of rotation 46 are rotating [both] in the direction of the arrow in drawing 1 by attaching in the 1st axis of rotation 42 and the 2nd axis of rotation 46, the one-way clutch attached in the axis of rotation with the larger rotational frequency can be engaged, and the drive gear 30 can be rotated. Since the axis of rotation with a smaller rotational frequency serves as an arrow in drawing 1 , and rotation of opposite direction as relative rotation to the drive gear 30 at this time, the state of the one-way clutch attached in this axis of rotation will be in the state where engagement was canceled. Therefore, the drive gear 30 will carry out a rotation drive between the two axes of rotation 42 and 46 by the axis of rotation with the always larger rotational frequency of the direction of the arrow in drawing 1 , and will generate [the oil pressure generator 20] oil pressure by the axis of rotation with this larger rotational frequency.
[0023] According to the oil pressure generator 20 of an example explained above, oil pressure can be generated between the two axes of rotation 42 and 46 by rotation of the axis of rotation with the larger rotational frequency of the predetermined direction. Consequently, oil pressure can be generated, even while one side will not rotate, if either of the two axes of rotation 42 and 46 is rotating in the predetermined direction. And the two axes of rotation can be simply chosen only by doubling the engaged direction and attaching an one-way clutch.
[0024] moreover, the engagement by which according to the oil pressure generator 20 of an example prepares the path clearance of the 1st axis of rotation 42 and a some, and attachment fixation is carried out -- since it is made for a member 44 and an one-way clutch 36 to be engaged, the backlash produced when the 1st axis of rotation 42 carries out eccentricity etc. by external force is absorbable Consequently, the oil pressure generator 20 can be made into that more durable, and it can be made what has a more high precision.
[0025] Although the 1st axis of rotation 42 shall connect the shaft center of the 2nd axis of rotation 46 to the two axes of rotation penetrated free [rotation] in the oil pressure generator 20 of an example, as shown in the oil pressure generator 50 of the modification of drawing 3 , it is good also as what is connected to the two axes of rotation 56 and 58 which extended from the direction which counters through one-way clutches 52 and 54, respectively. In addition, although only the two axes of rotation 56 and 58 and two one-way clutches 52 and 54 were indicated typically and illustration of other composition was omitted in the oil pressure generator 50 of the modification of drawing 3 , about other composition, it is the same as that of the oil pressure generator 20 of an example.
[0026] Although it attached in the oil pressure generator 20 of an example so that two one-way clutches 36 and 38 might be engaged with the two axes of rotation 42 and 46 in the predetermined direction, respectively, it is good for the three or more axes of rotation also as what attaches three or more one-way clutches so that it may be engaged in the predetermined direction, respectively. For example, as shown in the oil pressure generator 60 of the modification of drawing 4 , it is good for the three axes of rotation 72-76 also as what attaches three one-way clutches 62-66 so that it may be engaged in the predetermined direction, respectively. If it carries out like this, oil pressure can be generated by the axis of rotation with the largest rotational frequency of the predetermined direction among the three or more axes of rotation. In addition, only the three axes of rotation 72-76 and three one-way clutches 62-66 were typically indicated like [the oil pressure generator 60 of the modification of drawing 4]

drawing 3 .
[0027] Although considered as the composition which uses one-way clutches 36 and 38 for the two axes of rotation 42 and 46, and is connected to a gear pump (gear pump which consists of the drive gear 30, a driven gear 32, and a crescent sash lock 34) in the oil pressure generator 20 of an example As well as being good also as composition linked to the gear pump which uses one-way clutches 36 and 38 for the two axes of rotation 42 and 46, and is not equipped with a crescent sash lock 34, if oil pressure is generated for the axis of rotation as an input shaft of power, it is good as any composition other than the composition of a gear pump.
[0028] Although the 2nd axis of rotation 46 and one-way clutch 38 shall be engaged directly, you may make it the engagement member of the 1st axis of rotation 42 and an one-way clutch 36 by which prepares some path clearance in the 2nd axis of rotation 46 like engagement, and attachment fixation is carried out, and an one-way clutch 38 engaged in the oil pressure generator 20 of an example. If it carries out like this, the backlash produced in the 2nd axis of rotation 46 can be absorbed, and the oil pressure generator 20 can be made into what [more durable / a thing and what has a more high precision].
[0029] the oil pressure generator 20 of an example -- the 1st axis of rotation 42 and engagement -- although the member 44 was attached by lock-pin 44a, where some path clearance is prepared, as long as it is fixable, you may attach by what technique
[0030] Next, the power output unit 110 equipped with the oil pressure generator 20 as one example of this invention is explained. Drawing 5 is the block diagram showing the outline composition of the power output unit 110 equipped with the oil pressure generator 20.
[0031] The power output unit 110 consists of oil pressure generators 20 which supply a lubricating oil to the control unit 180 and planetary gear 120 which carry out drive control of the motor MG 2 combined with the starter ring 122 of the motor MG 1 greatly combined with the sun gear 121 of a planetary gear 120 and a planetary gear 120 with which the planetary carrier 124 was mechanically combined with the crankshaft 156 of an engine 150 and an engine 150, and a planetary gear 120, and the motors MG1 and MG2 so that it may illustrate.
[0032] The sun gear 121 combined with the sun gear shaft 125 in the air with which the planetary gear 120 penetrated the shaft center to the crankshaft 156, The starter ring 122 combined with the crankshaft 156 and the starter-ring shaft 126 of the hollow which penetrated the shaft center on the carrier shaft 127 on the same axle, Two or more planetary pinion gears 123 which revolve around the sun while it is arranged between a sun gear 121 and a starter ring 122 and the periphery of a sun gear 121 is rotated, It consists of planetary carriers 124 which are combined with the edge of a crankshaft 156 and support the axis of rotation of each planetary pinion gear 123 to revolve. In this planetary gear 120, the sun gear shaft 125 combined with the sun gear 121, the starter ring 122, and the planetary carrier 124, respectively, the starter-ring shaft 126, and three shafts of a crankshaft 156 are used as the I/O shaft of power, and if the power outputted and inputted among three shafts to any 2 shafts is determined, the power outputted and inputted by one residual shaft will become settled based on the power outputted and inputted biaxial [which was determined].
[0033] The power extraction gear 128 for the ejection of power is combined with the starter ring 122 at the motor MG 1 side. This power extraction gear 128 is connected to the power transfer gear 111 by the chain belt 129, and transfer of power is made between the power extraction gear 128 and the power transfer gear 111. Therefore, the power from the power output unit 110 can be taken out from this power transfer gear 111.
[0034] Both the motor MG 1 and the motor MG 2 are constituted as a synchronous motor generator, and are equipped with Rota 132,142 which has two or more permanent magnets 135,145 in a peripheral face, and the stator 133,143 around which the three phase coil 134,144 which forms rotating magnetic field was wound, respectively. Rota 132 of a motor MG 1 is combined with the sun gear shaft 125 combined with the sun gear 121 of a planetary gear 120, and Rota 142 of a motor MG 2 is combined with the starter-ring shaft 126 combined with the starter ring 122 of a planetary gear 120. Moreover, the resolver 139,149 for detecting the angle of rotation theta1 and theta2 of each Rota 132,142 is formed in each motors MG1 and MG2.
[0035] The oil pressure generator 20 is connected to the carrier shaft 127 and the starter-ring

shaft 126 which were combined with the planetary carrier 124 by the same axle through the two one-way clutches 36 and 38, respectively, and the casing 22 of the oil pressure generator 20 is formed as the case 147 where the stator 143 of a motor MG 2 was attached, and one. In addition, the composition of the oil pressure generator 20 is carrying out the same composition as the oil pressure generator 20 which explained the two axes of rotation 42 and 46 using drawing 1 and drawing 2 except for the point that the point and casing 22 which were replaced with the carrier shaft 127 and the starter-ring shaft 126 are formed as a case 147 and one. Therefore, it omits about explanation of each composition of the oil pressure generator 20 here. Thus, in the power output unit 110, since the oil pressure generator 20 is made into the big mass which vibrates united with a motor MG 1 by forming the casing 22 of the oil pressure generator 20 as a case 147 and one, the damping effect over vibration produced by operating an engine 150 can be enlarged. and the engagement by which prepared some path clearance for engagement to the carrier shaft 127 as an input shaft of an engine 150 and one-way clutch 36 which are the generation source of vibration in the carrier shaft 127, and attachment fixation was carried out -- the shell considered as the composition performed through a member 44 -- Even if backlash arises on the carrier shaft 127 by vibration, disturbance, etc. which an engine 150 does not expect, this backlash can be absorbed and the input to the oil pressure generators 20, such as disturbance, can be made small.

[0036] Although not illustrated about the detail of a control unit 180, a control unit 180 Two inverter circuits which make the false sinusoidal current supplied to the three phase each coil 134,144 of a motor MG 1 and a motor MG 2, The battery which carries out charge and discharge through two inverter circuits, and CPU for motor control which controls switching of two inverter circuits, It has CPU for engine control which controls operation of an engine 150, and operation of a motor MG 1, a motor MG 2, and an engine 150 is controlled based on the signal inputted from the various sensors which detect the state of a motor MG 1, a motor MG 2, and an engine 150. Since it is unnecessary as a gestalt of operation of this invention about the detail of control by this control unit 180, it omits about the explanation.

[0037] Next, operation of the power output unit 110 constituted in this way is explained. When operating an engine 150 on a rotational frequency Ne and the operation point P1 of Torque Te and operating the starter-ring shaft 126 now on a rotational frequency Nr which is different although it is the same energy as the energy Pe outputted from this engine 150, and the operation point P2 of Torque Tr, the case where carry out torque conversion and the power outputted from an engine 150 is made to act on the starter-ring shaft 126 is considered.

[0038] According to the place which mechanism study teaches, the relation between the rotational frequency in three shafts (the sun gear shaft 125, the starter-ring shaft 126, and planetary carrier 124) of a planetary gear 120 or torque can be expressed as drawing called collinear view illustrated to drawing 6 and drawing 7 , and can be solved geometrically. In addition, the rotational frequency of three shafts and the relation of torque to a planetary gear 120 are also analyzable in formula by calculating the energy of each shaft etc., even if it does not use an above-mentioned collinear view. By this example, since explanation is easy, it explains using a collinear view.

[0039] The vertical axis in drawing 6 is a rotational frequency shaft of three shafts, and a horizontal axis expresses the ratio of the position of the axis of coordinates of three shafts. That is, when the axes of coordinates S and R of the sun gear shaft 125 and the starter-ring shaft 126 are taken to ends, the axis of coordinates C of the planetary carrier 124 is defined as a shaft which divides Shaft S and Shaft R interiorly to 1:rho. rho is the ratio of the number of teeth of a sun gear 121 to the number of teeth of a starter ring 122 here, and it is expressed with the following formula (1).

[0040]

[Equation 1]

$$\rho = \frac{\text{サンギヤの歯数}}{\text{リングギヤの歯数}} \quad \cdots\cdots(1)$$

[0041] The rotational frequency Ne of an engine 150 can be plotted on the axis of coordinates C of the planetary carrier 124 with which the crankshaft 156 of an engine 150 is combined since the case where the engine 150 is now operated at the rotational frequency Ne, and the starter-ring shaft 126 is operated at the rotational frequency Nr is considered, and a rotational frequency Nr can be plotted on the axis of coordinates R of the starter-ring shaft 126. If the straight line which passes along both this point is drawn, it can ask for the rotational frequency Ns of the sun gear shaft 125 as a rotational frequency expressed with the intersection of this straight line and axis of coordinates S. Hereafter, this straight line is called collinear of operation. In addition, it can ask for a rotational frequency Ns by the proportion formula (the following formula (2)) using a rotational frequency Ne and a rotational frequency Nr. Thus, in a planetary gear 120, if any two rotations are determined among a sun gear 121, a starter ring 122, and the planetary carrier 124, one residual rotation will be determined based on two determined rotations.

[0042]
[Equation 2]

$$Ns = Nr - (Nr - Ne)\frac{1+\rho}{\rho} \quad \cdots\cdots(2)$$

[0043] Next, the torque Te of an engine 150 is made to act on the drawn collinear of operation upwards from drawing Nakashita by making the axis of coordinates C of the planetary carrier 124 into line of action. Since a collinear of operation can be dealt with as the rigid body at the time of making the force as a vector act to torque at this time, the torque Te made to act on an axis of coordinates C is separable into the torque Tes on an axis of coordinates S, and the torque Ter on an axis of coordinates R with the technique of separation of the force to the line of action from which the sense is the same as and differs. The size of Torque Tes and Ter is expressed by the following formula (3) and (4) at this time.
[0044]
[Equation 3]

$$Tes = Te \times \frac{\rho}{1+\rho} \quad \cdots\cdots(3)$$

$$Ter = Te \times \frac{1}{1+\rho} \quad \cdots\cdots(4)$$

[0045] What is necessary is just to take balance of the force of a collinear of operation, in order for the collinear of operation to be stable in this state. That is, a size is the same as Torque Tes, the torque Tm1 with the opposite sense is made to act, a size is the same to resultant force with torque and Torque Ter with the opposite sense on an axis of coordinates R in the same size as the torque Tr outputted to the starter-ring shaft 126, and the sense makes the opposite torque Tm2 act on an axis of coordinates S. This torque Tm1 can act by the motor MG 1, and torque Tm2 can be made to act by the motor MG 2. Since torque is made to act on direction of rotation and a retrose by the motor MG 1 at this time, a motor MG 1 will operate as a generator and revives electrical energy Pm1 expressed with the product of torque Tm1 and a rotational frequency Ns from the sun gear shaft 125. By the motor MG 2, since the direction of torque is the same as direction of rotation, a motor MG 2 operates as a motor and is outputted to the starter-ring shaft 126 by making into power electrical energy Pm2 expressed by the product of torque Tm2 and a rotational frequency Nr.
[0046] Here, if electrical energy Pm1 and electrical energy Pm2 are made equal, all the power consumed by the motor MG 2 can be revived by the motor MG 1, and it can be provided. What is necessary is for that just to make equal the thing which outputs all the inputted energy then the energy Pe outputted from an engine 150 since it is good, and energy Pr outputted to the starter-ring shaft 126. That is, the energy Pe expressed with the product of Torque Te and a rotational frequency Ne and energy Pr expressed with the product of Torque Tr and a rotational frequency Nr are made equal. As mentioned above, the power outputted to the starter-ring shaft 126 is transmitted to a driving shaft 112 by the power extraction gear 128 and the power transfer gear 111, and is transmitted to a driving wheel 116,118 through a differential gear 114. Therefore,

since a linear relation is materialized for the power outputted to the starter-ring shaft 126, and the power transmitted to a driving wheel 116,118, the power transmitted to a driving wheel 116,118 is controllable by controlling the power outputted to the starter-ring shaft 126.
[0047] In the collinear view shown in drawing 6 , although the rotational frequency Ns of the sun gear shaft 125 is positive, as shown in the collinear view shown in drawing 7 , it may serve as negative at the rotational frequency Ne of an engine 150, and the rotational frequency Nr of the starter-ring shaft 126. At this time, by the motor MG 1, since direction of rotation and the direction where torque acts become the same, a motor MG 1 operates as a motor and consumes electrical energy Pm1 expressed by the product of torque Tm1 and a rotational frequency Ns. On the other hand, by the motor MG 2, since direction of rotation and the direction where torque acts become reverse, a motor MG 2 will operate as a generator and will revive electrical energy Pm2 expressed by the product of torque Tm2 and a rotational frequency Nr from the starter-ring shaft 126. In this case, if electrical energy Pm1 consumed by the motor MG 1 and electrical energy Pm2 revived by the motor MG 2 are made equal, electrical energy Pm1 consumed by the motor MG 1 can be exactly provided by the motor MG 2.
[0048] In the state of the collinear view of such drawing 6 and drawing 7 , since the rotational frequency Nr of the link gear shaft 126 is larger than the rotational frequency Ne Nc of an engine 150, i.e., the rotational frequency of the carrier shaft 127, the one-way clutch 38 attached in the starter-ring shaft 126 will be in an engagement state, by rotation of the starter-ring shaft 126, the drive gear 30 drives both the oil pressure generators 20, and they generate oil pressure.
[0049] Although the case where an engine 150 was operated on the operation point of the rotational frequency Ne smaller than the rotational frequency Nr of the starter-ring shaft 126 was explained in the state of the collinear view of drawing 6 and drawing 7 , the power output unit 110 of an example can also operate an engine 150 on the operation point of the bigger rotational frequency Ne than the rotational frequency Nr of the starter-ring shaft 126, as shown in drawing 8 . In this case, since the rotational frequency Nc of the carrier shaft 127 combined with the crankshaft 156 of an engine 150 through the planetary carrier 124 becomes larger than the rotational frequency Nr of the starter-ring shaft 126, in the oil pressure generator 20, the one-way clutch 36 attached in the carrier shaft 127 will be in an engagement state, and oil pressure will be generated by rotation of the carrier shaft 127.
[0050] Moreover, the power output unit 110 of an example can stop operation of an engine 150, and can also drive it by the motor MG 2. The collinear view at this time is illustrated to drawing 9 . Since the engine 150 has stopped operation, the rotational frequency Ne of an engine 150 serves as a value 0, and the rotational frequency Nc of the carrier shaft 127 also serves as a value 0, so that it may illustrate. However, since the starter-ring shaft 126 is carrying out the rotation drive by the motor MG 2, the oil pressure generator 20 can generate oil pressure by rotation of this starter-ring shaft 126.
[0051] The power output unit 110 of an example can operate an engine 150, where vehicles are suspended, and it can also charge the battery with which a control unit 180 is equipped and which is not illustrated by operating a motor MG 1 as a generator. The collinear view of this state is shown in drawing 10 . Since vehicles are in the stopped state so that it may illustrate, the rotational frequency Nr of the starter-ring shaft 126 serves as a value 0. However, since the engine 150 is operated, the oil pressure generator 20 can generate oil pressure with the carrier shaft 127 combined with the crankshaft 156 of this engine 150.
[0052] As mentioned above, by having the oil pressure generator 20 connected to the starter-ring shaft 126 and the carrier shaft 127 according to the explained power output unit 110 of an example, if either of the starter-ring shaft 126 and the carrier shaft 127 is rotating, oil pressure can be generated. That is, if the engine 150 is operated or vehicles are moving forward, oil pressure can be generated with the oil pressure generator 20. And since one-way clutches 36 and 38 are used for the starter-ring shaft 126 and the carrier shaft 127 and it connects with the composition of one gear pump, equipment can be miniaturized as compared with the composition which equips separately the starter-ring shaft 126 and the carrier shaft 127 with a gear pump.
[0053] Moreover, in the power output unit 110 of an example, since it forms as the case 147 where the casing 22 of the oil pressure generator 20 was attached in the stator 143 of a motor

MG 2, and one, the oil pressure generator 20 can be made into the big mass which vibrates united with a motor MG 2, and the damping effect over vibration can be enlarged. and the engagement by which prepared some path clearance for engagement to the carrier shaft 127 as an input shaft of an engine 150 and one-way clutch 36 which are the generation source of vibration in the carrier shaft 127, and attachment fixation was carried out -- the shell considered as the composition performed through a member 44 -- Even if backlash arises on the carrier shaft 127 by vibration, disturbance, etc. which an engine 150 does not expect, this backlash can be absorbed and the input to the oil pressure generators 20, such as disturbance, can be made small.

[0054] Although the starter-ring shaft 126 and an one-way clutch 38 shall be engaged directly, you may make it the engagement member of the carrier shaft 127 and an one-way clutch 36 by which prepares some path clearance in the starter-ring shaft 126 like engagement, and attachment fixation is carried out, and an one-way clutch 38 engaged in the power output unit 110 of an example. If it carries out like this, the backlash produced on the starter-ring shaft 126 can be absorbed, and the oil pressure generator 20, as a result the power output unit 110 can be made into what [more durable / a thing and what has a more high precision].

[0055] In the power output unit 110 of an example, it is good also as composition which attaches the oil pressure generator 20 in what power output unit in which the drive with an engine and the drive by the motor are possible although the oil pressure generator 20 was attached in the composition driven by the engine 150, the planetary gear 120, and a motor MG 1 and Motor MG 2.

[0056] As mentioned above, although the gestalt of operation of this invention was explained, as for this invention, it is needless to say that it can carry out with the gestalt which is not limited to the gestalt of such operation at all, and becomes various within limits which do not deviate from the power output unit of an example from the summary of means of transportation, such as a vessel and an aircraft, and this inventions, such as composition carried in various industrial machines etc. in addition to this.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the cross section which illustrates the outline composition of the oil pressure generator 20 which is one example of this invention.
[Drawing 2] It is the cross section of the B-B line cross section of the oil pressure generator 20 of drawing 1 .
[Drawing 3] It is the ** type view which illustrates typically the composition of the oil pressure generator 50 which is a modification.
[Drawing 4] It is the ** type view which illustrates typically the composition of the oil pressure generator 60 which is a modification.
[Drawing 5] It is the block diagram which illustrates the outline composition of the power output unit 110 equipped with the oil pressure generator 20 of an example as composition.
[Drawing 6] It is the collinear view showing the rotational frequency of three shafts and the relation of torque which were combined with the planetary gear 120.
[Drawing 7] It is the collinear view showing the rotational frequency of three shafts and the relation of torque which were combined with the planetary gear 120.
[Drawing 8] It is a collinear view when the rotational frequency Ne of an engine 150 is bigger than the rotational frequency Nr of the starter-ring shaft 126.
[Drawing 9] It is a collinear view in case operation of an engine 150 is stopped.
[Drawing 10] It is a collinear view in the case of having stopped rotation of the starter-ring shaft 126.
[Drawing 11] It is the block diagram which illustrates the outline composition of the gear pump 200 of the conventional example.
[Description of Notations]
20 -- Oil pressure generator
22 -- Casing
24 -- Inflow path
26 -- Outflow path
28 -- Tap hole
30 -- Drive gear
32 -- Driven gear
34 -- Crescent sash lock
36 38 -- One-way clutch
40 -- Holddown member
42 -- Axis of rotation
44 -- engagement -- a member
44a -- Lock-pin
46 -- Axis of rotation
50 -- Oil pressure generator
52 54 -- One-way clutch
56 58 -- Axis of rotation
60 -- Oil pressure generator

62-66 -- One-way clutch
72-76 -- Axis of rotation
110 -- Power output unit
111 -- Power transfer gear
112 -- Driving shaft
114 -- Differential gear
116,118 -- Driving wheel
120 -- Planetary gear
121 -- Sun gear
122 -- Starter ring
123 -- Planetary pinion gear
124 -- Planetary carrier
125 -- Sun gear shaft
126 -- Link gear shaft
126 -- Starter-ring shaft
127 -- Carrier shaft
128 -- Power extraction gear
129 -- Chain belt
132,142 -- Rota
133,143 -- Stator
134,144 -- Three phase coil
135,145 -- Permanent magnet
139,149 -- Resolver
142 -- Rota
147 -- Case
150 -- Engine
156 -- Crankshaft
180 -- Control unit
200 -- Gear pump
202 -- Drive gear
204 -- Driven gear
220 -- Casing
224 -- Inflow path
226 -- Outflow path
230 -- Drive gear
232 -- Driven gear
234 -- Crescent sash lock
MG1 -- Motor
MG2 -- Motor

[Translation done.]

* NOTICES *

CORRECTION or AMENDMENT

[Official Gazette Type] Printing of amendment by the convention of 2 of Article 17 of patent law
[Section partition] The 2nd partition of the 5th section
[Date of issue] October 26, Heisei 11 (1999)

[Publication No.] Publication number 10-89446
[Date of Publication] April 7, Heisei 10 (1998)
[**** format] Open patent official report 10-895
[Filing Number] Japanese Patent Application No. 9-87728
[International Patent Classification (6th Edition)]

F16H 57/02 501

[FI]

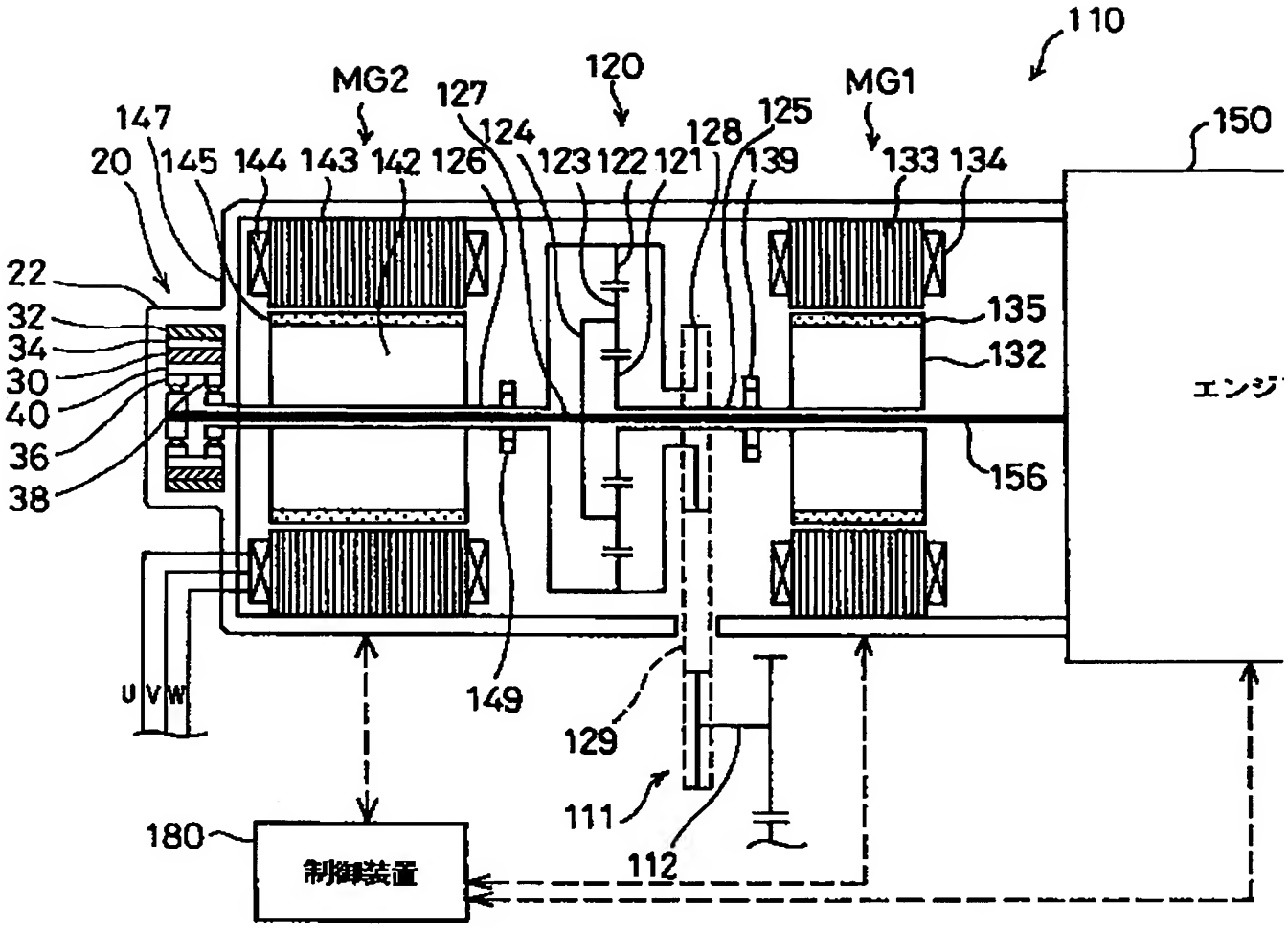
F16H 57/02 501 D

[Procedure revision]
[Filing Date] January 13, Heisei 11
[Procedure amendment 1]
[Document to be Amended] Specification
[Item(s) to be Amended] Claim
[Method of Amendment] Change
[Proposed Amendment]
[Claim(s)]
[Claim 1] It is the oil pressure generator which generates oil pressure according to the rotational-motion force in which it is inputted into an input shaft.
The two or more axes of rotation which can input different rotational-motion force,
It intervenes, respectively between the two or more [above] axes of rotation and the aforementioned input shaft for the rotational-motion force input to the aforementioned input shaft, and although the rotational-motion force of the predetermined direction is transmitted, it has the one-way clutch which does not transmit the rotational-motion force of a direction opposite to this predetermined direction.
The aforementioned input shaft is an oil pressure generator characterized by having opening in a shaft center, and arranging and having an one-way clutch for every two or more [above] axes of rotation in this opening.
[Claim 2] Each of the aforementioned input shaft and the two or more [above] axes of rotation is an oil pressure generator according to claim 1 arranged in the shape of the said heart.
[Claim 3] It is the power output unit which outputs power to a driving shaft.
The prime mover which has an output shaft,
The 1st motor which has the 1st axis of rotation, and outputs and inputs power to this 1st axis of rotation,
The 2nd motor which has the 2nd axis of rotation combined with the aforementioned driving

shaft, and outputs and inputs power to this 2nd axis of rotation,
A 3 shaft type power I/O means by which the power outputted and inputted to one residual shaft based on the this determined power when the power which has three shafts respectively combined with the output shaft of the aforementioned prime mover, the 1st axis of rotation of the 1st motor of the above, and the 2nd axis of rotation of the 2nd motor of the above, and is outputted and inputted among these three shafts to any 2 shafts is determined is determined,
It has an oil pressure generator according to claim 1 or 2.
It is the power output unit whose two axes of rotation are the axis of rotation combined with the output shaft of the aforementioned prime mover, and the axis of rotation combined with the 2nd axis of rotation of the 2nd motor of the above between the two or more axes of rotation of the aforementioned oil pressure generator.
[Claim 4] The aforementioned oil pressure generator is a power output unit according to claim 3 which it comes to support as the 2nd motor of the above, and one.
[Claim 5] The power output unit according to claim 3 or 4 which comes to prepare the gap which can absorb backlash between the axes of rotation and these output shafts which are combined with the aforementioned output shaft of the aforementioned oil pressure generator.
[Claim 6] There is no claim 3 which comes to prepare the gap which can absorb backlash between the axis of rotation and this 2nd axis of rotation which are combined with the 2nd axis of rotation of the above of the aforementioned oil pressure generator, and it is the power output unit of a publication 5 either.
[Procedure amendment 2]
[Document to be Amended] Specification
[Item(s) to be Amended] 0009
[Method of Amendment] Change
[Proposed Amendment]
[0009]
[A The means for solving a technical problem, and its operation and effect] The two or more axes of rotation which can input rotational-motion force which the oil pressure generator of this invention is an oil pressure generator which generates oil pressure according to the rotational-motion force in which it is inputted into an input shaft, and is different, It intervenes, respectively between the two or more [above] axes of rotation and the aforementioned input shaft for the rotational-motion force input to the aforementioned input shaft. Although the rotational-motion force of the predetermined direction is transmitted, it has the one-way clutch which does not transmit the rotational-motion force of a direction opposite to this predetermined direction, and the aforementioned input shaft has opening in a shaft center, and it is characterized by arranging and having an one-way clutch for every two or more [above] axes of rotation in this opening.
[Procedure amendment 3]
[Document to be Amended] Specification
[Item(s) to be Amended] 0010
[Method of Amendment] Change
[Proposed Amendment]
[0010] The oil pressure generator of this this invention makes rotational-motion 1 of the two or more axes of rotation transmit to an input shaft by the one-way clutch made to intervene, respectively between different two or more axes of rotation and input shafts which can input the rotational-motion force, and generates oil pressure according to the rotational-motion force in which it is inputted into an input shaft in this way.
[Procedure amendment 4]
[Document to be Amended] Specification
[Item(s) to be Amended] 0011
[Method of Amendment] Change
[Proposed Amendment]
[0011] According to the oil pressure generator of such this invention, since one of the two or more axes of rotation is chosen through an one-way clutch, oil pressure can be generated with the power outputted from one source of power chosen among the power outputted from two or

more sources of power.
[Procedure amendment 5]
[Document to be Amended] Specification
[Item(s) to be Amended] 0012
[Method of Amendment] Change
[Proposed Amendment]
[0012] And in the oil pressure generator of this this invention, since transfer of the rotational-motion force to an input shaft is made by the one-way clutch for every axis of rotation, the axis of rotation with the largest rotational frequency of the predetermined direction is chosen between the two or more axes of rotation. Therefore, while being able to generate oil pressure with the power inputted into the biggest axis of rotation of the rotational frequency of the predetermined direction, simple composition can constitute the oil pressure generator which chooses the biggest axis of rotation of the rotational frequency of the predetermined direction. In addition, in the oil pressure generator of this invention, since the one-way clutch for every axis of rotation was arranged in opening of an input-shaft shaft center, this one-way clutch is settled in opening. Therefore,-izing of the equipment size can be carried out [short **] about the shaft orientations of an input shaft, and the miniaturization of the part and equipment can be attained.
[Procedure amendment 6]
[Document to be Amended] Specification
[Item(s) to be Amended] 0013
[Method of Amendment] Change
[Proposed Amendment]
[0013] In the oil pressure generator of this this invention, each of the aforementioned input shaft and the two or more [above] axes of rotation can also be arranged in the shape of the said heart. If it carries out like this,-izing can be carried out [short **] also about the direction size of a path of an input shaft, and equipment can be miniaturized more.
[Procedure amendment 7]
[Document to be Amended] Specification
[Item(s) to be Amended] 0015
[Method of Amendment] Change
[Proposed Amendment]
[0015] The power output unit of this this invention outputs and inputs the power with which a 3 shaft type power I/O means to have three shafts respectively combined with the output shaft of a prime mover, the 1st axis of rotation of the 1st motor, and the 2nd axis of rotation of the 2nd motor is determined based on this power outputted and inputted when power is outputted and inputted to any 2 shafts of these three shafts from one residual shaft. An oil pressure generator sets the two or more axes of rotation for the rotational-motion force transfer to the input shaft through the one-way clutch as the axis of rotation combined with the output shaft of a prime mover, and the axis of rotation combined with the 2nd axis of rotation of the 2nd motor, and generates oil pressure with the power outputted from a prime mover, or the power outputted from the 2nd motor.
[Procedure amendment 8]
[Document to be Amended] Specification
[Item(s) to be Amended] 0016
[Method of Amendment] Change
[Proposed Amendment]
[0016] According to the power output unit of such this invention, oil pressure can be generated with the power outputted from a prime mover, or the power outputted from the 2nd motor by choosing the axis of rotation combined with the output shaft of a prime mover, and the axis of rotation combined with the 2nd axis of rotation of the 2nd motor through an one-way clutch.
[Procedure amendment 9]
[Document to be Amended] Specification
[Item(s) to be Amended] 0017

[Method of Amendment] Change
[Proposed Amendment]
[0017] In the power output unit of such this invention, it shall come to support the aforementioned oil pressure generator as the 2nd motor of the above, and one. If it carries out like this, to the oil pressure generator with which the arrangement relation between an one-way clutch and an input shaft was specified, and the miniaturization was attained, the 2nd motor will become what of the damping effect has large mass big, and an oil pressure generator will become the 2nd motor and the thing of one on it. Therefore, disturbance, such as vibration of the prime mover inputted into an oil pressure generator, can be made small. Consequently, while being able to raise the endurance of an oil pressure generator, as a result the endurance of a power output unit, precision of an oil pressure generator, as a result a power output unit can be made high.
[Procedure amendment 10]
[Document to be Amended] Specification
[Item(s) to be Amended] 0020
[Method of Amendment] Change
[Proposed Amendment]
[0020] The oil pressure generator 20 is equipped with the crescent sash lock 34 pinched with the casing 22 which is the same composition as the gear pump 200 of the conventional example explained using drawing 11, i.e., the composition as a gear pump, the drive gear 30, the driven gear 32 which gears with the drive gear 30 and rotates, and the drive gear 30 and a driven gear 32 as shown in drawing 1 and drawing 2. And this oil pressure generator 20 is equipped with the one-way clutch 38 which engages with the 2nd axis of rotation 46 of the hollow shaft to which the shaft center was penetrated free [rotation] to the 1st axis of rotation 42 only at the time of rotation of the predetermined direction as characteristic composition as well as the one-way clutch 36 to which it engages with the 1st axis of rotation 42 of a hollow shaft only at the time of rotation of the predetermined direction. As shown in drawing 1 and drawing 2, these one-way clutches 36 and 38 are arranged in the breakthrough vacated for the shaft center of the drive gear 30, and are being fixed to the drive gear 30 through the holddown member 40. And let the drive gear 30, and the 1st and the 2nd axis of rotation 42 and 46 be these hearts by taking such arrangement.
[Procedure amendment 11]
[Document to be Amended] Specification
[Item(s) to be Amended] 0023
[Method of Amendment] Change
[Proposed Amendment]
[0023] According to the oil pressure generator 20 of an example explained above, oil pressure can be generated between the two axes of rotation 42 and 46 by rotation of the axis of rotation with the larger rotational frequency of the predetermined direction. Consequently, oil pressure can be generated, even while one side will not rotate, if either of the two axes of rotation 42 and 46 is rotating in the predetermined direction. And the two axes of rotation can be simply chosen only by doubling the engaged direction and attaching an one-way clutch. Moreover, in this oil pressure generator 20, as shown in drawing 1 and drawing 2, the concentric arrangement of arrangement and receipt of the one-way clutches 36 and 38 into the breakthrough of the drive gear 30 and the drive gear 30, and the 1st and the 2nd axis of rotation 42 and 46 were taken. Therefore, since-izing of both the equipment sizes can be carried out [short **] about the shaft orientations and the direction of a path of the drive gear 30, the oil pressure generator itself can be miniaturized.
[Procedure amendment 12]
[Document to be Amended] DRAWINGS
[Item(s) to be Amended] drawing 5
[Method of Amendment] Change
[Proposed Amendment]
[Drawing 5]



[Translation done.]

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号

特開平10－89446

(43)公開日　平成10年(1998)４月７日

(51)Int.Cl.[6]	識別記号	ＦＩ	
Ｆ１６Ｈ　57/02	５０１	Ｆ１６Ｈ　57/02	５０１Ｄ

審査請求　未請求　請求項の数７　ＦＤ　（全 11 頁）

(21)出願番号　特願平9－87728

(22)出願日　平成９年(1997)３月21日

(31)優先権主張番号　特願平8－215284

(32)優先日　平８(1996)７月26日

(33)優先権主張国　日本（ＪＰ）

(71)出願人　000003207
トヨタ自動車株式会社
愛知県豊田市トヨタ町１番地

(72)発明者　足立　昌俊
愛知県豊田市トヨタ町１番地　トヨタ自動車株式会社内

(72)発明者　茨木　隆次
愛知県豊田市トヨタ町１番地　トヨタ自動車株式会社内

(72)発明者　畑　祐志
愛知県豊田市トヨタ町１番地　トヨタ自動車株式会社内

(74)代理人　弁理士　五十嵐　孝雄　（外２名）

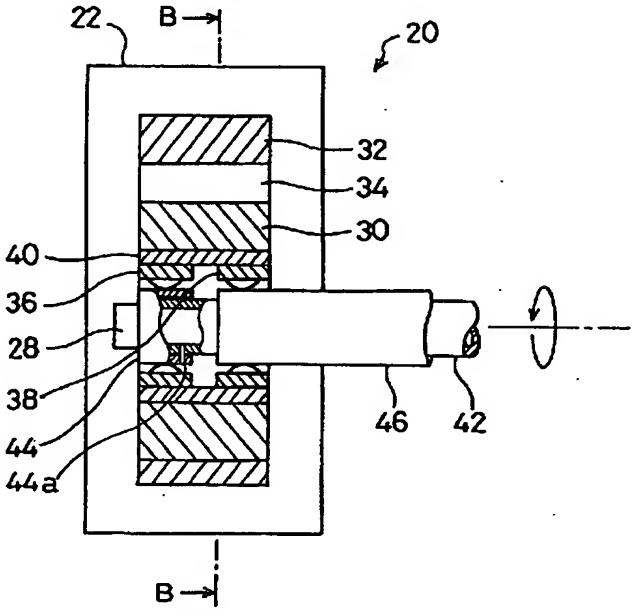
最終頁に続く

(54)【発明の名称】　油圧発生装置および動力出力装置

(57)【要約】

【課題】　２以上の回転動力のうち一つを入力動力として選択して油圧を発生する。

【解決手段】　油圧発生装置２０は、歯車ポンプを構成するドライブギヤ３０，ドリブンギヤ３２およびクレセント３４と、２つの回転軸４２，４６がドライブギヤ３０に対してそれぞれが相対的に同一の方向に回転するときに係合するよう取り付けられたワンウェイクラッチ３６，３８とを備える。このため、２つの回転軸４２，４６が共に係合する方向に回転しているときには、回転数の大きい方の回転軸に取り付けられたワンウェイクラッチが係合し、ドライブギヤ３０を駆動する。この結果、油圧発生装置２０は、２つの回転軸４２，４６のうち回転数の大きい方の回転軸によって油圧を発生することができる。



【特許請求の範囲】
【請求項１】　入力軸に入力される回転動力により油圧を発生する油圧発生装置であって、
異なる回転動力を入力可能な２以上の回転軸と、
該２以上の回転軸のうち一つを前記入力軸として選択する選択手段とを備える油圧発生装置。
【請求項２】　前記選択手段は、前記２以上の回転軸のうち所定方向の回転数が最も大きい回転軸を選択する手段である請求項１記載の油圧発生装置。
【請求項３】　前記選択手段は、前記所定方向の回転のときには回転動力を伝達するが該所定方向と反対の方向の回転のときには回転動力を伝達しないワンウェイクラッチを、前記２以上の回転軸の各々に前記入力軸に対して取り付けてなる手段である請求項２記載の油圧発生装置。
【請求項４】　駆動軸に動力を出力する動力出力装置であって、
出力軸を有する原動機と、
第１の回転軸を有し、該第１の回転軸に動力を入出力する第１の電動機と、
前記駆動軸に結合される第２の回転軸を有し、該第２の回転軸に動力を入出力する第２の電動機と、
前記原動機の出力軸と前記第１の電動機の第１の回転軸と前記第２の電動機の第２の回転軸とに各々結合される３軸を有し、該３軸のうちいずれか２軸へ入出力される動力を決定したとき、該決定された動力に基づいて残余の１軸へ入出力される動力が決定される３軸式動力入出力手段と、
請求項１ないし３いずれか記載の油圧発生装置とを備え、
前記油圧発生装置の２以上の回転軸のうち２つの回転軸は、前記原動機の出力軸に結合される回転軸と前記第２の電動機の第２の回転軸に結合される回転軸である動力出力装置。
【請求項５】　前記油圧発生装置は、前記第２の電動機と一体として支持されてなる請求項４記載の動力出力装置。
【請求項６】　前記油圧発生装置の前記出力軸に結合される回転軸と該出力軸との間にガタを吸収可能な間隙を設けてなる請求項４または５記載の動力出力装置。
【請求項７】　前記油圧発生装置の前記第２の回転軸に結合される回転軸と該第２の回転軸との間にガタを吸収可能な間隙を設けてなる請求項４ないし６いずれか記載の動力出力装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、油圧発生装置および動力出力装置に関し、詳しくは、入力軸に入力される回転動力により油圧を発生する油圧発生装置およびこれを備え駆動軸に動力を出力する動力出力装置に関する。
【０００２】
【従来の技術】従来、この種の油圧発生装置としては、車両に搭載される油圧発生装置であって、トルクコンバータへの送油やトランスミッション内のプラネタリギヤユニットの潤滑およびトランスミッションの油圧制御の作用油圧供給等のために、トランスミッションの一構成部品として原動機（例えば、ガソリンエンジンやディーゼルエンジンなどの内燃機関等）のクランクシャフトに直接または間接に取り付けられ、原動機からクランクシャフトに出力される回転動力の一部を動力として駆動するものが提案されている。この装置は、例えば、図１１に例示する歯車ポンプ２００のように、ケーシング２２０と、クランクシャフトに結合されたドライブギヤ２３０と、ドライブギヤ２３０と噛み合って回転するドリブンギヤ２３２と、ドライブギヤ２３０とドリブンギヤ２３２とで挟持されるクレセント２３４とから構成され、ドライブシャフトの回転に伴ってドライブギヤ２３０とドリブンギヤ２３２が回転することにより油圧を発生させる。なお、ケーシング２２０には、オイルの流入通路２２４および流出通路２２６が形成されている。
【０００３】
【発明が解決しようとする課題】近年、環境保全やエネルギ資源の効率利用の観点から、原動機と発電機と電動機とバッテリとを搭載し、原動機から出力される動力による走行と、電動機から出力される動力による走行と、原動機と電動機とからそれぞれ出力される動力による走行とを可能とする、いわゆるハイブリッド型の電気自動車が提案されている。こうしたハイブリッド型の電気自動車でも、原動機のクランクシャフトと駆動輪に結合される駆動軸との接続がギヤ装置による場合にはこのギヤ装置の潤滑のために、原動機のクランクシャフトと駆動軸との接続がクラッチによる場合にはこのクラッチの動作のために、また、変速機等のギヤ装置を備えるときにはこのギヤ装置の潤滑のために、油圧発生装置が必要となる。
【０００４】しかしながら、こうしたハイブリッド型の電気自動車に搭載する油圧発生装置として前述の歯車ポンプ２００を原動機のクランクシャフトに取り付けた場合、原動機が運転されているときには油圧を発生できるが、電動機から出力される動力により走行し原動機の運転を停止しているときには油圧発生装置は動作しないから油圧を発生させることができず、クラッチの動作やギヤ装置の潤滑等が行なえないという問題があった。一方、歯車ポンプ２００を駆動軸に取り付け、駆動軸の回転動力により油圧を発生させる手法もあるが、車両が停止しているときには、油圧を発生できないという問題を生じる。
【０００５】こうした問題に対して、原動機のクランクシャフトと駆動軸とにそれぞれ歯車ポンプ２００を取り付けることも考えられるが、歯車ポンプ２００が２つ必

要となることから部品数が多くなり装置が大型化するという問題や、油圧回路が複雑になるという問題が生じる。

【０００６】これらの問題は、原動機と電動機とを搭載する車両に限定されるものではなく、２以上の動力源から出力される動力により動作するすべての駆動装置についてもいえることである。

【０００７】なお、出願人は、以前に、ギヤ装置を備えるハイブリッド型の電気自動車であって、原動機のクランクシャフトに油圧ポンプを取り付けた構成（特開昭５０－３０２２３号公報）や、原動機のクランクシャフトと駆動軸のそれぞれに油圧ポンプを取り付けた構成（特開昭４８－４９１１５号公報）を提案している。

【０００８】本発明の油圧発生装置および動力出力装置は、こうした問題を解決し、２以上の回転動力のうち一つを入力動力として選択して油圧を発生することを目的とする。また、本発明の動力出力装置は、油圧発生装置への原動機の振動等の外乱の入力を小さくして、装置の耐久性を向上させると共により精度の高い装置とすることを目的の一つとする。

【０００９】

【課題を解決するための手段およびその作用・効果】本発明の油圧発生装置は、入力軸に入力される回転動力により油圧を発生する油圧発生装置であって、異なる回転動力を入力可能な２以上の回転軸と、該２以上の回転軸のうち一つを前記入力軸として選択する選択手段とを備えることを要旨とする。

【００１０】この本発明の油圧発生装置は、異なる回転動力を入力可能な２以上の回転軸のうち、選択手段により一つを入力軸として選択することにより、入力軸に入力される回転動力により油圧を発生する。

【００１１】こうした本発明の油圧発生装置によれば、２以上の回転軸のうち一つを選択して動力の入力軸とするから、２以上の動力源から出力される動力のうち選択された一つの動力源から出力される動力により油圧を発生することができる。

【００１２】この本発明の油圧発生装置において、前記選択手段は、前記２以上の回転軸のうち所定方向の回転数が最も大きい回転軸を選択する手段であるものとすることができる。こうすれば、所定方向の回転数の最も大きな回転軸に入力される動力により油圧を発生することができる。

【００１３】こうした所定方向の回転数の最も大きな回転軸を選択する油圧発生装置において、前記選択手段は、前記所定方向の回転のときには回転動力を伝達するが該所定方向と反対の方向の回転のときには回転動力を伝達しないワンウェイクラッチを、前記２以上の回転軸の各々に前記入力軸に対して取り付けてなる手段であるものとすることもできる。こうすれば、所定方向の回転数の最も大きな回転軸を選択する油圧発生装置を簡易な構成により構成することができる。

【００１４】本発明の動力出力装置は、駆動軸に動力を出力する動力出力装置であって、出力軸を有する原動機と、第１の回転軸を有し、該第１の回転軸に動力を入出力する第１の電動機と、前記駆動軸に結合される第２の回転軸を有し、該第２の回転軸に動力を入出力する第２の電動機と、前記原動機の出力軸と前記第１の電動機の第１の回転軸と前記第２の電動機の第２の回転軸とに各々結合される３軸を有し、該３軸のうちいずれか２軸へ入出力される動力を決定したとき、該決定された動力に基づいて残余の１軸へ入出力される動力が決定される３軸式動力入出力手段と、前述の変形例を含めた本発明の油圧発生装置とを備え、前記油圧発生装置の２以上の回転軸のうち２つの回転軸は、前記原動機の出力軸に結合される回転軸と前記第２の電動機の第２の回転軸に結合される回転軸であることを要旨とする。

【００１５】この本発明の動力出力装置は、３軸式動力入出力手段が、原動機の出力軸と第１の電動機の第１の回転軸と第２の電動機の第２の回転軸とに各々結合される３軸を有する３軸式動力入出力手段が、これらの３軸のうちのいずれか２軸へ動力が入出力されたとき、この入出力された動力に基づいて決定される動力を残余の１軸から入出力する。油圧発生装置は、原動機の出力軸に結合される回転軸と第２の電動機の第２の回転軸に結合される回転軸とを入力軸として選択可能な２以上の回転軸とし、原動機から出力される動力や第２の電動機から出力される動力により油圧を発生する。

【００１６】こうした本発明の動力出力装置によれば、原動機の出力軸に結合される回転軸や第２の電動機の第２の回転軸に結合される回転軸を選択することにより、原動機から出力される動力や第２の電動機から出力される動力により油圧を発生することができる。

【００１７】こうした本発明の動力出力装置において、前記油圧発生装置は、前記第２の電動機と一体として支持されてなるものとすることもできる。こうすれば、油圧発生装置に対して質量が大きく制振効果の大きな第２の電動機と一体のものとなるから、油圧発生装置へ入力される原動機の振動等の外乱を小さくすることができる。この結果、油圧発生装置の耐久性、延いては動力出力装置の耐久性を向上させることができると共に、油圧発生装置、延いては動力出力装置の精度を高くすることができる。

【００１８】こうした油圧発生装置が第２の電動機と一体として支持されてなる動力出力装置において、前記油圧発生装置の前記出力軸に結合される回転軸と該出力軸との間にガタを吸収可能な間隙を設けてなるものとしたり、前記油圧発生装置の前記第２の回転軸に結合される回転軸と該第２の回転軸との間にガタを吸収可能な間隙を設けてなるものとすることもできる。こうすれば、原動機の出力軸や第２の回転軸に予期しない振動等の外乱

が生じても、外乱の油圧発生装置への入力を小さくすることができる。

【００１９】

【発明の実施の形態】次に、本発明の実施の形態を実施例に基づき説明する。図１は本発明の一実施例としての油圧発生装置２０の概略構成を示す断面図、図２は図１の油圧発生装置２０のＢ－Ｂ断面を示す断面図である。なお、図１は、図２におけるＡ－Ａ断面を示す断面図となる。

【００２０】油圧発生装置２０は、図１および図２に示すように、図１１を用いて説明した従来例の歯車ポンプ２００と同一の構成、即ち、歯車ポンプとしての構成であるケーシング２２と、ドライブギヤ３０と、ドライブギヤ３０と噛み合って回転するドリブンギヤ３２と、ドライブギヤ３０とドリブンギヤ３２とで挟持されるクレセント３４とを備える他、所定方向の回転のときのみ中空軸の第１の回転軸４２と係合するワンウェイクラッチ３６と、同じく所定方向の回転のときのみ軸中心を第１の回転軸４２に回転自在に貫通された中空軸の第２の回転軸４６と係合するワンウェイクラッチ３８と、ワンウェイクラッチ３６，３８をドライブギヤ３０に固定する固定部材４０とを備える。

【００２１】ケーシング２２には、図２に示すように、ドライブギヤ３０とドリブンギヤ３２の隙間のうちクレセント３４の右下側の隙間と連通するオイルの流入通路２４と、同じくクレセント３４の左下側の隙間と連通するオイルの流出通路２６とが形成されている。この流出通路２６は、図１に示すケーシング２２に形成された流出口２８と連絡しており、オイルは、この流出口２８から第１の回転軸４２の内側へ圧送される。

【００２２】ワンウェイクラッチ３６は、第１の回転軸４２がドライブギヤ３０に対して相対的に図１中の矢印の方向に回転しようとするときに第１の回転軸４２の外周に取付固定された円環状の係合部材４４に係合するよう取り付けられている。実施例では、この係合部材４４は、第１の回転軸４２との間に若干のクリアランスが設けられた状態で固定ピン４４ａにより第１の回転軸４２に固定されている。したがって、第１の回転軸４２が外力により偏心してもこのクリアランスによっていわゆるガタが吸収されるようになっている。また、ワンウェイクラッチ３８は、第２の回転軸４６がドライブギヤ３０に対して相対的に図１中の矢印の方向に回転しようとするときに第２の回転軸４６に係合するよう取り付けられている。このように第１の回転軸４２および第２の回転軸４６に取り付けることにより、第１の回転軸４２と第２の回転軸４６とが共に図１中の矢印の方向に回転しているときには、その回転数の大きい方の回転軸に取り付けられたワンウェイクラッチが係合してドライブギヤ３０を回転させることができる。このとき、回転数の小さい方の回転軸はドライブギヤ３０に対する相対的な回転としては図１中の矢印と反対方向の回転となるから、この回転軸に取り付けられたワンウェイクラッチの状態は係合を解除した状態となる。したがって、ドライブギヤ３０は、２つの回転軸４２，４６のうち、常に図１中の矢印の方向の回転数の大きい方の回転軸により回転駆動することになり、油圧発生装置２０は、この回転数の大きい方の回転軸により油圧を発生することになる。

【００２３】以上説明した実施例の油圧発生装置２０によれば、２つの回転軸４２，４６のうち所定方向の回転数の大きい方の回転軸の回転によって油圧を発生することができる。この結果、２つの回転軸４２，４６のいずれかが所定方向に回転していれば一方が回転していないときでも油圧を発生することができる。しかも、ワンウェイクラッチを、その係合する方向を合わせて取り付けるだけで２つの回転軸の選択を簡易に行なうことができる。

【００２４】また、実施例の油圧発生装置２０によれば、第１の回転軸４２と若干のクリアランスを設けて取付固定される係合部材４４とワンウェイクラッチ３６とが係合するようにしているから、第１の回転軸４２が外力によって偏心等することによって生じるガタを吸収することができる。この結果、油圧発生装置２０をより耐久性のあるものにすることができ、より精度の高いものにすることができる。

【００２５】実施例の油圧発生装置２０では、第１の回転軸４２が第２の回転軸４６の軸中心を回転自在に貫通した２つの回転軸に接続するものとしたが、図３の変形例の油圧発生装置５０に示すように、対向する方向から延出した２つの回転軸５６，５８にそれぞれワンウェイクラッチ５２，５４を介して接続するものとしてもよい。なお、図３の変形例の油圧発生装置５０では、２つの回転軸５６，５８と２つのワンウェイクラッチ５２，５４だけを模式的に記載し、他の構成の図示は省略したが、この他の構成については実施例の油圧発生装置２０と同一である。

【００２６】実施例の油圧発生装置２０では、２つの回転軸４２，４６に２つのワンウェイクラッチ３６，３８をそれぞれ所定方向に係合するよう取り付けたが、３以上の回転軸に３以上のワンウェイクラッチをそれぞれ所定方向に係合するよう取り付けるものとしてもよい。例えば、図４の変形例の油圧発生装置６０に示すように、３つの回転軸７２～７６に３つのワンウェイクラッチ６２～６６をそれぞれ所定方向に係合するよう取り付けるものとしてもよい。こうすれば、３以上の回転軸のうち所定方向の回転数が最も大きい回転軸により油圧を発生することができる。なお、図４の変形例の油圧発生装置６０も図３と同様に３つの回転軸７２～７６と３つのワンウェイクラッチ６２～６６だけを模式的に記載した。

【００２７】実施例の油圧発生装置２０では、２つの回転軸４２，４６にワンウェイクラッチ３６，３８を用い

て歯車ポンプ（ドライブギヤ３０，ドリブンギヤ３２およびクレセント３４とからなる歯車ポンプ）に接続する構成としたが、２つの回転軸４２，４６にワンウェイクラッチ３６，３８を用いてクレセント３４を備えない歯車ポンプに接続する構成としてもよいことは勿論、回転軸を動力の入力軸として油圧を発生するものであれば、歯車ポンプの構成以外の如何なる構成としてもよい。

【００２８】実施例の油圧発生装置２０では、第２の回転軸４６とワンウェイクラッチ３８とが直接係合するものとしたが、第１の回転軸４２とワンウェイクラッチ３６との係合のように、第２の回転軸４６に若干のクリアランスを設けて取付固定される係合部材とワンウェイクラッチ３８とが係合するようにしてもよい。こうすれば、第２の回転軸４６に生じるガタを吸収することができ、油圧発生装置２０をより耐久性のあるもの及びより精度の高いものにすることができる。

【００２９】実施例の油圧発生装置２０では、第１の回転軸４２と係合部材４４とを固定ピン４４ａにより取り付けたが、若干のクリアランスを設けた状態で固定できればいかなる手法により取り付けてもよい。

【００３０】次に、本発明の一実施例としての油圧発生装置２０を備える動力出力装置１１０について説明する。図５は、油圧発生装置２０を備える動力出力装置１１０の概略構成を示すブロック図である。

【００３１】図示するように、動力出力装置１１０は、大きくは、エンジン１５０、エンジン１５０のクランクシャフト１５６にプラネタリキャリア１２４が機械的に結合されたプラネタリギヤ１２０、プラネタリギヤ１２０のサンギヤ１２１に結合されたモータＭＧ１、プラネタリギヤ１２０のリングギヤ１２２に結合されたモータＭＧ２、モータＭＧ１，ＭＧ２を駆動制御する制御装置１８０およびプラネタリギヤ１２０に潤滑油を供給する油圧発生装置２０とから構成されている。

【００３２】プラネタリギヤ１２０は、クランクシャフト１５６に軸中心を貫通された中空のサンギヤ軸１２５に結合されたサンギヤ１２１と、クランクシャフト１５６と同軸でキャリア軸１２７に軸中心を貫通された中空のリングギヤ軸１２６に結合されたリングギヤ１２２と、サンギヤ１２１とリングギヤ１２２との間に配置されサンギヤ１２１の外周を自転しながら公転する複数のプラネタリピニオンギヤ１２３と、クランクシャフト１５６の端部に結合され各プラネタリピニオンギヤ１２３の回転軸を軸支するプラネタリキャリア１２４とから構成されている。このプラネタリギヤ１２０では、サンギヤ１２１，リングギヤ１２２およびプラネタリキャリア１２４にそれぞれ結合されたサンギヤ軸１２５，リングギヤ軸１２６およびクランクシャフト１５６の３軸が動力の入出力軸とされ、３軸のうちいずれか２軸へ入出力される動力が決定されると、残余の１軸に入出力される動力は決定された２軸へ入出力される動力に基づいて定まる。

【００３３】リングギヤ１２２には、動力の取り出し用の動力取出ギヤ１２８がモータＭＧ１側に結合されている。この動力取出ギヤ１２８は、チェーンベルト１２９により動力伝達ギヤ１１１に接続されており、動力取出ギヤ１２８と動力伝達ギヤ１１１との間で動力の伝達がなされる。したがって、動力出力装置１１０からの動力は、この動力伝達ギヤ１１１から取り出すことができる。

【００３４】モータＭＧ１とモータＭＧ２は、共に同期電動発電機として構成されており、それぞれ外周面に複数個の永久磁石１３５，１４５を有するロータ１３２，１４２と、回転磁界を形成する三相コイル１３４，１４４が巻回されたステータ１３３，１４３とを備える。モータＭＧ１のロータ１３２は、プラネタリギヤ１２０のサンギヤ１２１に結合されたサンギヤ軸１２５に結合されており、モータＭＧ２のロータ１４２は、プラネタリギヤ１２０のリングギヤ１２２に結合されたリングギヤ軸１２６に結合されている。また、各モータＭＧ１，ＭＧ２にはそれぞれのロータ１３２，１４２の回転角度θ１，θ２を検出するためのレゾルバ１３９，１４９が設けられている。

【００３５】油圧発生装置２０は、プラネタリキャリア１２４に同軸に結合されたキャリア軸１２７とリングギヤ軸１２６とに２つワンウェイクラッチ３６，３８を介してそれぞれ接続されており、油圧発生装置２０のケーシング２２は、モータＭＧ２のステータ１４３が取り付けられたケース１４７と一体として形成されている。なお、油圧発生装置２０の構成は、２つの回転軸４２，４６をキャリア軸１２７およびリングギヤ軸１２６に代えた点およびケーシング２２がケース１４７と一体として形成されている点を除いて図１および図２を用いて説明した油圧発生装置２０と同一の構成をしている。したがって、ここでは油圧発生装置２０の各構成の説明については省略する。このように動力出力装置１１０では、油圧発生装置２０のケーシング２２をケース１４７と一体として形成することによって油圧発生装置２０をモータＭＧ１と一体となって振動する大きなマスとするから、エンジン１５０を運転することによって生じる振動に対する制振効果を大きくすることができる。しかも、振動の発生源であるエンジン１５０の入力軸としてのキャリア軸１２７とワンウェイクラッチ３６との係合をキャリア軸１２７に若干のクリアランスを設けて取付固定された係合部材４４を介して行なう構成としたから、エンジン１５０の予期しない振動や外乱等によりキャリア軸１２７にガタが生じても、このガタを吸収することができ、外乱等の油圧発生装置２０への入力を小さくすることができる。

【００３６】制御装置１８０の詳細については図示しないが、制御装置１８０は、モータＭＧ１およびモータＭ

Ｇ２の各三相コイル１３４，１４４に供給する擬似的な正弦波電流を作り出す２つのインバータ回路と、２つのインバータ回路を介して充放電するバッテリと、２つのインバータ回路のスイッチングを制御するモータ制御用ＣＰＵと、エンジン１５０の運転を制御するエンジン制御用ＣＰＵとを備え、モータＭＧ１，モータＭＧ２およびエンジン１５０の状態を検出する各種センサから入力される信号に基づいてモータＭＧ１，モータＭＧ２およびエンジン１５０の運転を制御する。この制御装置１８０による制御の詳細については、本発明の実施の形態としては不要であるから、その説明については省略する。

【００３７】次に、こうして構成された動力出力装置１１０の動作について説明する。いま、エンジン１５０を回転数Ｎｅ，トルクＴｅの運転ポイントＰ１で運転し、このエンジン１５０から出力されるエネルギＰｅと同一のエネルギであるが異なる回転数Ｎｒ，トルクＴｒの運転ポイントＰ２でリングギヤ軸１２６を運転する場合、すなわち、エンジン１５０から出力される動力をトルク変換してリングギヤ軸１２６に作用させる場合について考える。

【００３８】プラネタリギヤ１２０の３軸（サンギヤ軸１２５，リングギヤ軸１２６およびプラネタリキャリア１２４）における回転数やトルクの関係は、機構学の教えるところによれば、図６および図７に例示する共線図と呼ばれる図として表わすことができ、幾何学的に解くことができる。なお、プラネタリギヤ１２０における３軸の回転数やトルクの関係は、上述の共線図を用いなくても各軸のエネルギを計算することなどにより数式的に解析することもできる。本実施例では説明の容易のため共線図を用いて説明する。

【００３９】図６における縦軸は３軸の回転数軸であり、横軸は３軸の座標軸の位置の比を表わす。すなわち、サンギヤ軸１２５とリングギヤ軸１２６の座標軸Ｓ，Ｒを両端にとったとき、プラネタリキャリア１２４の座標軸Ｃは、軸Ｓと軸Ｒを１：ρに内分する軸として定められる。ここで、ρは、リングギヤ１２２の歯数に対するサンギヤ１２１の歯数の比であり、次式（１）で表わされる。

【００４０】

【数１】

$$\rho = \frac{\text{サンギヤの歯数}}{\text{リングギヤの歯数}} \quad \cdots\cdots(1)$$

【００４１】今、エンジン１５０が回転数Ｎｅで運転されており、リングギヤ軸１２６が回転数Ｎｒで運転されている場合を考えているから、エンジン１５０のクランクシャフト１５６が結合されているプラネタリキャリア１２４の座標軸Ｃにエンジン１５０の回転数Ｎｅを、リングギヤ軸１２６の座標軸Ｒに回転数Ｎｒをプロットすることができる。この両点を通る直線を描けば、この直線と座標軸Ｓとの交点で表わされる回転数としてサンギヤ軸１２５の回転数Ｎｓを求めることができる。以下、この直線を動作共線と呼ぶ。なお、回転数Ｎｓは、回転数Ｎｅと回転数Ｎｒとを用いて比例計算式（次式（２））により求めることができる。このようにプラネタリギヤ１２０では、サンギヤ１２１，リングギヤ１２２およびプラネタリキャリア１２４のうちいずれか２つの回転を決定すると、残余の１つの回転は、決定した２つの回転に基づいて決定される。

【００４２】

【数２】

$$Ns = Nr - (Nr - Ne)\frac{1+\rho}{\rho} \quad \cdots\cdots(2)$$

【００４３】次に、描かれた動作共線に、エンジン１５０のトルクＴｅをプラネタリキャリア１２４の座標軸Ｃを作用線として図中下から上に作用させる。このとき動作共線は、トルクに対してはベクトルとしての力を作用させたときの剛体として取り扱うことができるから、座標軸Ｃ上に作用させたトルクＴｅは、向きが同じで異なる作用線への力の分離の手法により、座標軸Ｓ上のトルクＴｅｓと座標軸Ｒ上のトルクＴｅｒとに分離することができる。このときトルクＴｅｓおよびＴｅｒの大きさは、次式（３）および（４）によって表わされる。

【００４４】

【数３】

$$Tes = Te \times \frac{\rho}{1+\rho} \quad \cdots\cdots(3)$$

$$Ter = Te \times \frac{1}{1+\rho} \quad \cdots\cdots(4)$$

【００４５】動作共線がこの状態で安定であるためには、動作共線の力の釣り合いをとればよい。すなわち、座標軸Ｓ上には、トルクＴｅｓと大きさが同じで向きが反対のトルクＴｍ１を作用させ、座標軸Ｒ上には、リングギヤ軸１２６に出力するトルクＴｒと同じ大きさで向きが反対のトルクとトルクＴｅｒとの合力に対し大きさが同じで向きが反対のトルクＴｍ２を作用させるのである。このトルクＴｍ１はモータＭＧ１により、トルクＴｍ２はモータＭＧ２により作用させることができる。このとき、モータＭＧ１では回転の方向と逆向きにトルクを作用させるから、モータＭＧ１は発電機として動作することになり、トルクＴｍ１と回転数Ｎｓとの積で表わされる電気エネルギＰｍ１をサンギヤ軸１２５から回生する。モータＭＧ２では、回転の方向とトルクの方向とが同じであるから、モータＭＧ２は電動機として動作し、トルクＴｍ２と回転数Ｎｒとの積で表わされる電気エネルギＰｍ２を動力としてリングギヤ軸１２６に出力する。

【００４６】ここで、電気エネルギＰｍ１と電気エネルギＰｍ２とを等しくすれば、モータＭＧ２で消費する電力のすべてをモータＭＧ１により回生して賄うことがで

きる。このためには、入力されたエネルギのすべてを出力するものとすればよいから、エンジン１５０から出力されるエネルギＰｅとリングギヤ軸１２６に出力されるエネルギＰｒとを等しくすればよい。すなわち、トルクＴｅと回転数Ｎｅとの積で表わされるエネルギＰｅと、トルクＴｒと回転数Ｎｒとの積で表わされるエネルギＰｒとを等しくするのである。前述したように、リングギヤ軸１２６に出力された動力は、動力取出ギヤ１２８および動力伝達ギヤ１１１により駆動軸１１２に伝達され、ディファレンシャルギヤ１１４を介して駆動輪１１６，１１８に伝達される。したがって、リングギヤ軸１２６に出力される動力と駆動輪１１６，１１８に伝達される動力とにはリニアな関係が成立するから、駆動輪１１６，１１８に伝達される動力は、リングギヤ軸１２６に出力される動力を制御することにより制御することができる。

【００４７】図６に示す共線図ではサンギヤ軸１２５の回転数Ｎｓは正であったが、エンジン１５０の回転数Ｎｅとリングギヤ軸１２６の回転数Ｎｒとによっては、図７に示す共線図のように負となる場合もある。このときには、モータＭＧ１では、回転の方向とトルクの作用する方向とが同じになるから、モータＭＧ１は電動機として動作し、トルクＴｍ１と回転数Ｎｓとの積で表わされる電気エネルギＰｍ１を消費する。一方、モータＭＧ２では、回転の方向とトルクの作用する方向とが逆になるから、モータＭＧ２は発電機として動作し、トルクＴｍ２と回転数Ｎｒとの積で表わされる電気エネルギＰｍ２をリングギヤ軸１２６から回生することになる。この場合、モータＭＧ１で消費する電気エネルギＰｍ１とモータＭＧ２で回生する電気エネルギＰｍ２とを等しくすれば、モータＭＧ１で消費する電気エネルギＰｍ１をモータＭＧ２で丁度賄うことができる。

【００４８】こうした図６および図７の共線図の状態では、油圧発生装置２０は、共にリンクギヤ軸１２６の回転数Ｎｒの方がエンジン１５０の回転数Ｎｅ、即ちキャリア軸１２７の回転数Ｎｃより大きいから、リングギヤ軸１２６に取り付けられたワンウェイクラッチ３８が係合状態となってリングギヤ軸１２６の回転によってドライブギヤ３０が駆動し、油圧を発生する。

【００４９】図６および図７の共線図の状態では、リングギヤ軸１２６の回転数Ｎｒより小さな回転数Ｎｅの運転ポイントでエンジン１５０を運転する場合について説明したが、実施例の動力出力装置１１０は、図８に示すように、リングギヤ軸１２６の回転数Ｎｒより大きな回転数Ｎｅの運転ポイントでエンジン１５０を運転することもできる。この場合、エンジン１５０のクランクシャフト１５６にプラネタリキャリア１２４を介して結合されたキャリア軸１２７の回転数Ｎｃがリングギヤ軸１２６の回転数Ｎｒより大きくなるから、油圧発生装置２０では、キャリア軸１２７に取り付けられたワンウェイクラッチ３６が係合状態となって、キャリア軸１２７の回転によって油圧を発生する。

【００５０】また、実施例の動力出力装置１１０は、エンジン１５０の運転を停止し、モータＭＧ２のみにより駆動することもできる。このときの共線図を図９に例示する。図示するように、エンジン１５０は運転を停止しているから、エンジン１５０の回転数Ｎｅは値０となり、キャリア軸１２７の回転数Ｎｃも値０となる。しかし、リングギヤ軸１２６はモータＭＧ２により回転駆動しているから、油圧発生装置２０は、このリングギヤ軸１２６の回転によって油圧を発生することができる。

【００５１】実施例の動力出力装置１１０は、車両を停止した状態でエンジン１５０を運転し、モータＭＧ１を発電機として機能させることにより制御装置１８０が備える図示しないバッテリを充電することもできる。この状態の共線図を図１０に示す。図示するように、車両は停止した状態であるから、リングギヤ軸１２６の回転数Ｎｒは値０となる。しかし、エンジン１５０が運転されているから、油圧発生装置２０は、このエンジン１５０のクランクシャフト１５６に結合されたキャリア軸１２７によって油圧を発生することができる。

【００５２】以上、説明した実施例の動力出力装置１１０によれば、リングギヤ軸１２６とキャリア軸１２７とに接続された油圧発生装置２０を備えることにより、リングギヤ軸１２６とキャリア軸１２７とのいずれかが回転していれば油圧を発生することができる。即ち、エンジン１５０が運転されているか、車両が前進していれば、油圧発生装置２０により油圧を発生することができる。しかも、リングギヤ軸１２６とキャリア軸１２７とにワンウェイクラッチ３６，３８を用いて１つの歯車ポンプの構成に接続するから、リングギヤ軸１２６とキャリア軸１２７とに別個に歯車ポンプを備える構成に比して装置を小型化することができる。

【００５３】また、実施例の動力出力装置１１０では、油圧発生装置２０のケーシング２２をモータＭＧ２のステータ１４３が取り付けられたケース１４７と一体として形成するから、油圧発生装置２０をモータＭＧ２と一体となって振動する大きなマスとし、振動に対する制振効果を大きくすることができる。しかも、振動の発生源であるエンジン１５０の入力軸としてのキャリア軸１２７とワンウェイクラッチ３６との係合をキャリア軸１２７に若干のクリアランスを設けて取付固定された係合部材４４を介して行なう構成としたから、エンジン１５０の予期しない振動や外乱等によりキャリア軸１２７にガタが生じても、このガタを吸収することができ、外乱等の油圧発生装置２０への入力を小さくすることができる。

【００５４】実施例の動力出力装置１１０では、リングギヤ軸１２６とワンウェイクラッチ３８とが直接係合するものとしたが、キャリア軸１２７とワンウェイクラッ

チ３６との係合のように、リングギヤ軸１２６に若干のクリアランスを設けて取付固定される係合部材とワンウェイクラッチ３８とが係合するようにしてもよい。こうすれば、リングギヤ軸１２６に生じるガタを吸収することができ、油圧発生装置２０、延いては動力出力装置１１０をより耐久性のあるもの及びより精度の高いものにすることができる。

【００５５】実施例の動力出力装置１１０では、エンジン１５０と、プラネタリギヤ１２０と、モータＭＧ１と、モータＭＧ２とにより駆動する構成に油圧発生装置２０を取り付けたが、エンジンによる駆動とモータによる駆動とが可能な如何なる動力出力装置に油圧発生装置２０を取り付ける構成としてもよい。

【００５６】以上、本発明の実施の形態について説明したが、本発明はこうした実施の形態に何等限定されるものではなく、例えば、実施例の動力出力装置を船舶，航空機などの交通手段や、その他各種産業機械などに搭載する構成など、本発明の要旨を逸脱しない範囲内において、種々なる形態で実施し得ることは勿論である。

【図面の簡単な説明】

【図１】本発明の一実施例である油圧発生装置２０の概略構成を例示する断面図である。

【図２】図１の油圧発生装置２０のＢ－Ｂ線断面の断面図である。

【図３】変形例である油圧発生装置５０の構成を模式的に例示する模式図である。

【図４】変形例である油圧発生装置６０の構成を模式的に例示する模式図である。

【図５】実施例の油圧発生装置２０を構成として備える動力出力装置１１０の概略構成を例示する構成図である。

【図６】プラネタリギヤ１２０に結合された３軸の回転数とトルクの関係を示す共線図である。

【図７】プラネタリギヤ１２０に結合された３軸の回転数とトルクの関係を示す共線図である。

【図８】エンジン１５０の回転数Ｎｅがリングギヤ軸１２６の回転数Ｎｒより大きな場合の共線図である。

【図９】エンジン１５０の運転が停止されている場合の共線図である。

【図１０】リングギヤ軸１２６の回転を停止している場合の共線図である。

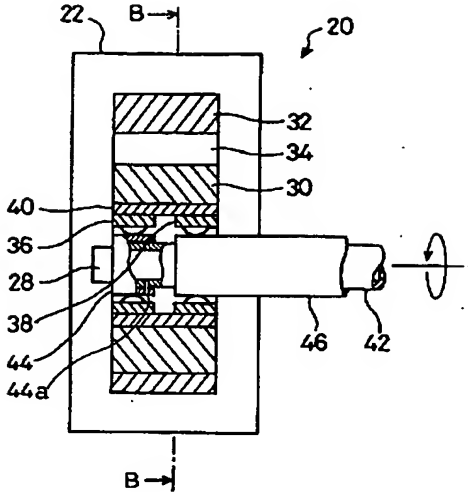
【図１１】従来例の歯車ポンプ２００の概略構成を例示する構成図である。

【符号の説明】

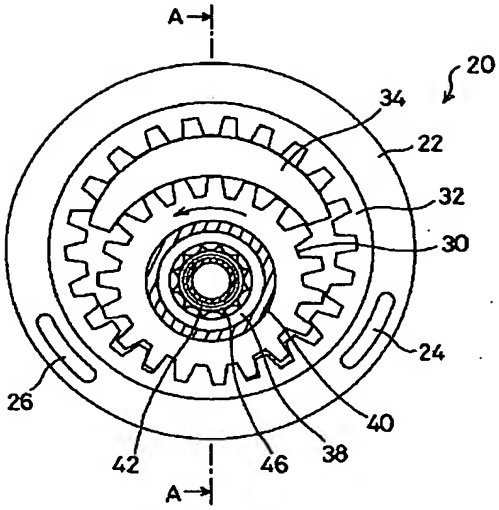
２０…油圧発生装置
２２…ケーシング
２４…流入通路
２６…流出通路
２８…流出口
３０…ドライブギヤ
３２…ドリブンギヤ
３４…クレセント
３６，３８…ワンウェイクラッチ
４０…固定部材
４２…回転軸
４４…係合部材
４４ａ…固定ピン
４６…回転軸
５０…油圧発生装置
５２，５４…ワンウェイクラッチ
５６，５８…回転軸
６０…油圧発生装置
６２～６６…ワンウェイクラッチ
７２～７６…回転軸
１１０…動力出力装置
１１１…動力伝達ギヤ
１１２…駆動軸
１１４…ディファレンシャルギヤ
１１６，１１８…駆動輪
１２０…プラネタリギヤ
１２１…サンギヤ
１２２…リングギヤ
１２３…プラネタリピニオンギヤ
１２４…プラネタリキャリア
１２５…サンギヤ軸
１２６…リンクギヤ軸
１２６…リングギヤ軸
１２７…キャリア軸
１２８…動力取出ギヤ
１２９…チェーンベルト
１３２，１４２…ロータ
１３３，１４３…ステータ
１３４，１４４…三相コイル
１３５，１４５…永久磁石
１３９，１４９…レゾルバ
１４２…ロータ
１４７…ケース
１５０…エンジン
１５６…クランクシャフト
１８０…制御装置
２００…歯車ポンプ
２０２…ドライブギヤ
２０４…ドリブンギヤ
２２０…ケーシング
２２４…流入通路
２２６…流出通路
２３０…ドライブギヤ
２３２…ドリブンギヤ
２３４…クレセント
ＭＧ１…モータ

MG2…モータ

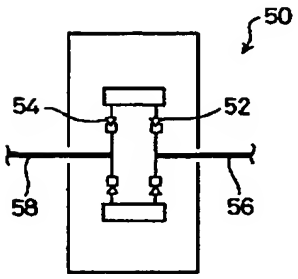
【図1】



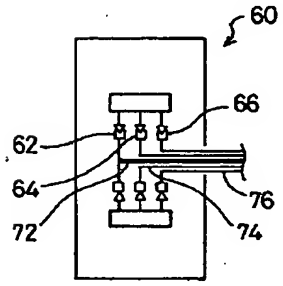
【図2】



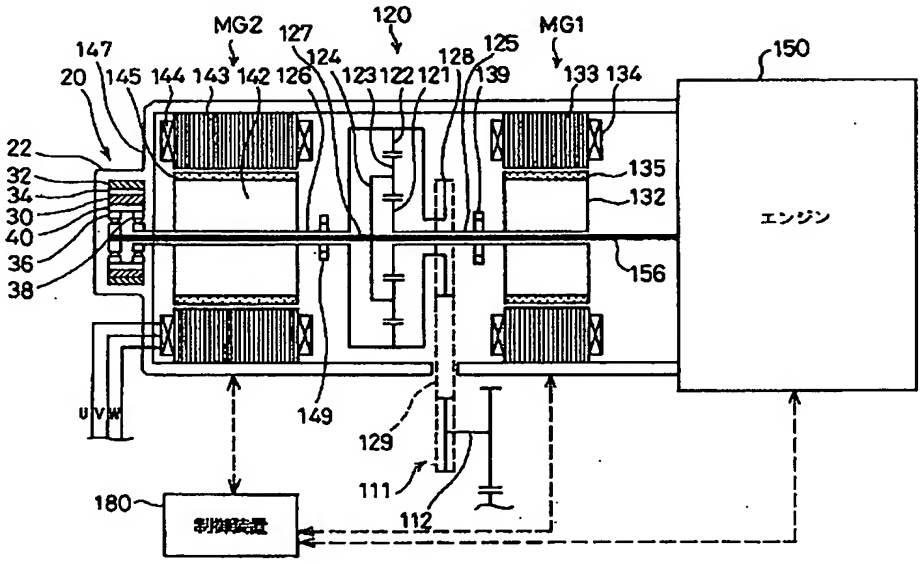
【図3】



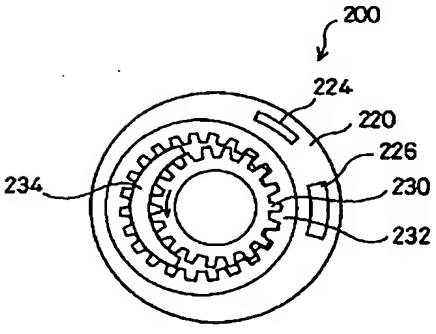
【図4】



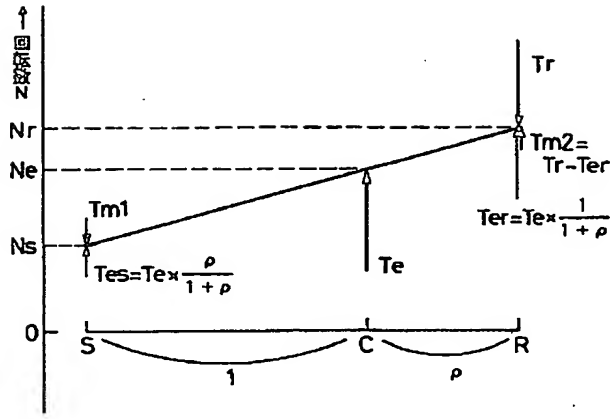
【図5】



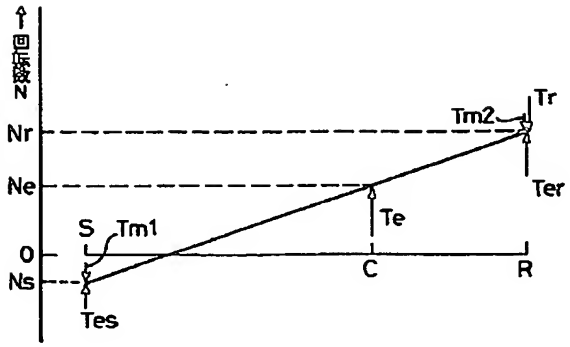
【図11】



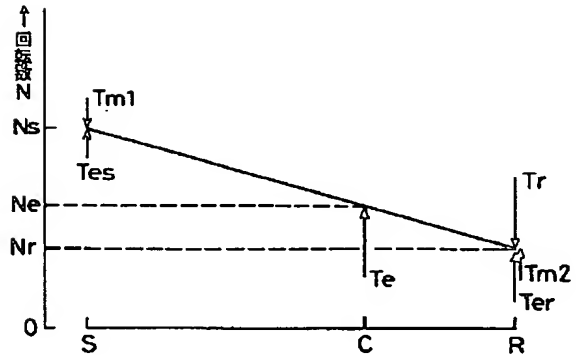
【図６】



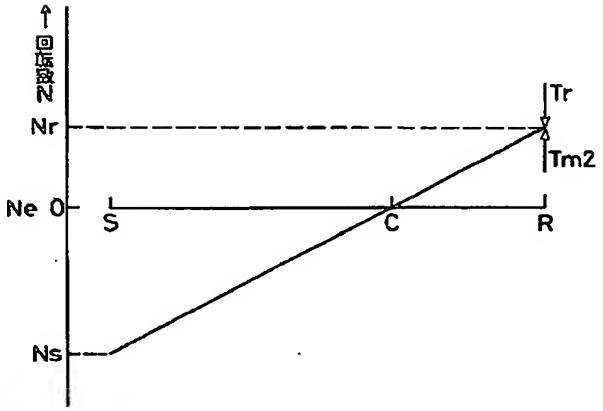
【図７】



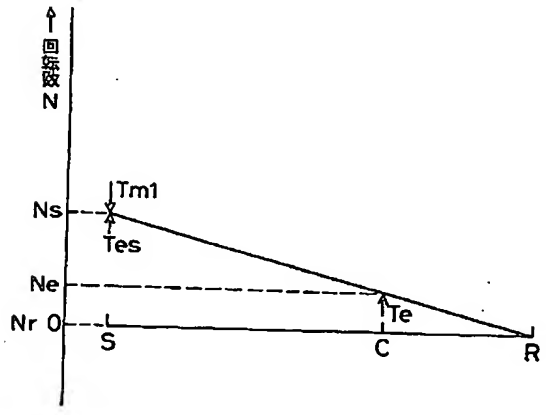
【図８】



【図９】



【図１０】



フロントページの続き

(72)発明者　鈴木　晴久
愛知県豊田市トヨタ町１番地　トヨタ自動車株式会社内

(72)発明者　近藤　宏一
愛知県豊田市トヨタ町１番地　トヨタ自動車株式会社内

(72)発明者　大島　啓次郎
愛知県豊田市トヨタ町１番地　トヨタ自動車株式会社内

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